Sec. 19-241 addresses the design criteria for all permanent stormwater management (water quantity) and Best Management Practice (water quality) basins. While this section outlines safety criteria for people that may be around the basin as a part of the basin design, this section does not outline the County's growing concern for the aesthetics of these basins. However, after a brief explanation of the safety criteria, we list suggestions that you should consider if your basin is visible to the public.

The safety criteria is designed to help prevent anyone from falling into the basin, or if they do, they are able to get out. Prior to the safety criteria becoming a part of the ordinance, basins were not regulated as to accessibility and steepness of side slopes. It was recognized that these steep-sloped, accessible basins could pose a hazard, especially to children who like to play around them. The safety criteria for small basins (average 4 foot depth and no more than an acre in size) is to have a safety bench around the basin or a fence. Large basins (more than 4 feet deep or greater than one acre in size) shall have a safety bench and an aquatic bench around the basin or a fence. The Director of Engineering may, at his discretion, require a fence if the basin is within 100 feet a dwelling unit, school, child care center, playground, shopping center, library, hospital, public institution, pedestrian way or similar facility.

A safety bench is a relatively flat area (no greater than 10:1 slope) located at the toe of a slope just above the normal water elevation. An aquatic bench is a minimum six foot wide bench with a maximum depth of 12 inches below the normal water surface elevation that is installed around the outside perimeter of the pond. A fence shall be six feet high or it may also be a dense vegetative barrier at the time of installation.

One other safety criteria applies whenever the pond is located in an R, R-TH, or R-MF district or upon any other property used for residential purposes, schools, child care centers, playgrounds, or within 100 feet of the above uses and any pedestrian access ways (sidewalks, bicycle paths, walkways). In any of these situations, the pond shall be separated from such uses by a minimum of a fifty (50) foot vegetative perimeter yard measured from the 100 year water surface elevation or the downstream toe of the dam, whichever applies.

When designing basins that will be visible to the public, we will look to you for how they can be made attractive, or at the very least, how you can limit their visibility.

WET BASINS: If the drainage area coming to the basin can include a large enough area, wet basins or ponds are typically most attractive (see photograph below with fountains often being added to maximize their appeal. If a fence is required, a decorative tubular steel or similar fence is strongly preferred over a chain link fence. Adding trees such as Weeping Willow or Bald Cypress can help soften the edges of the fenced pond and create a backdrop for a fountain.
Wet basins are the most effective method to remove pollutants to meet Chesapeake Bay requirements.

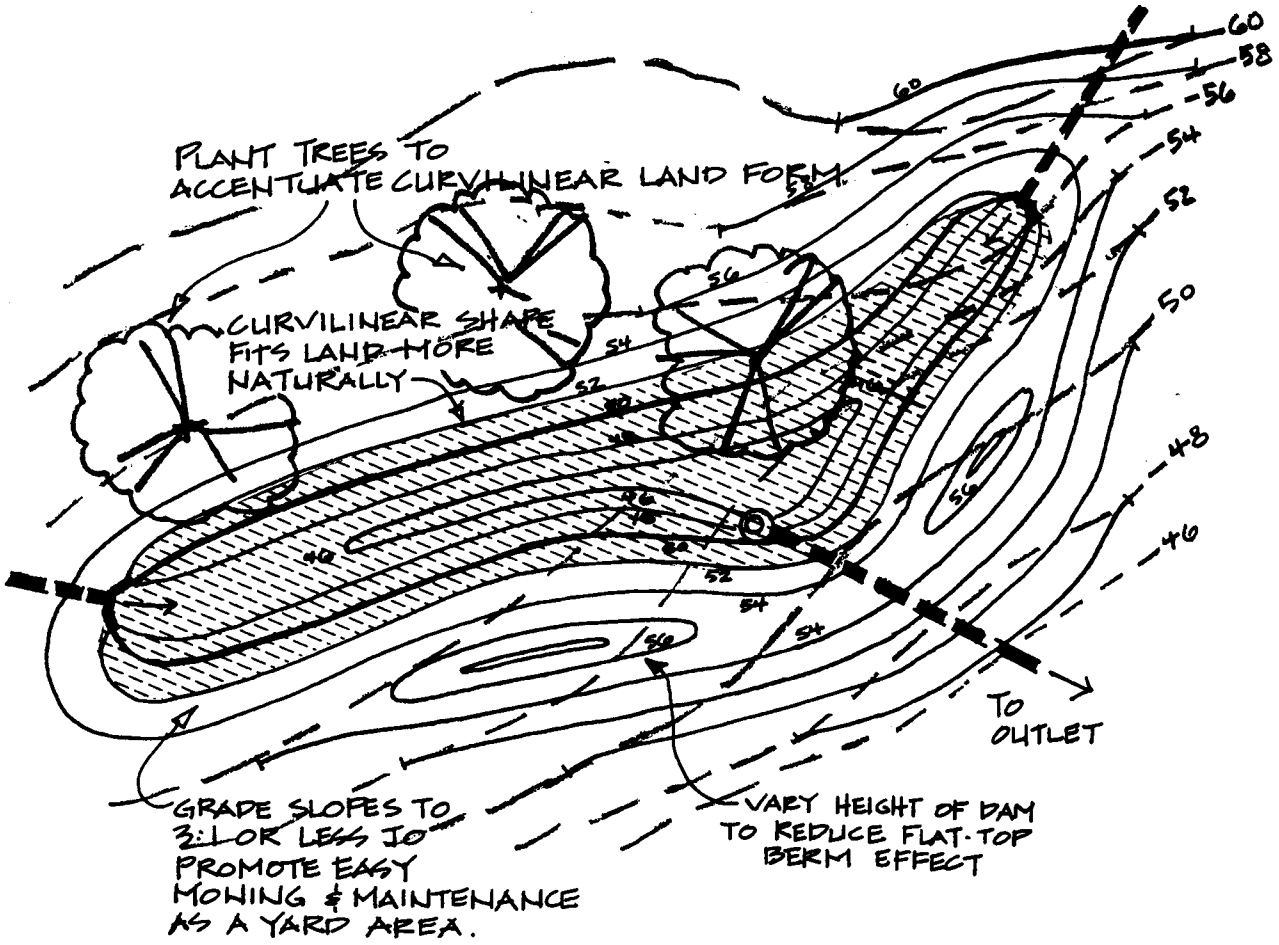
AQUATIC BASINS: Aquatic basins are often used when the basin is required for both Chesapeake Bay pollutant removal and stormwater management. While not as effective at removing pollutants as a wet pond, an aquatic basin with wetland plantings does remove pollutants while providing greater storage capacity for stormwater management. Aesthetically, aquatic basins can be visually unappealing if trash and debris is not removed or the design is box-shaped without appearing as a natural wetlands area. By using a curvilinear basin form that blends into existing land forms and appears to fit naturally on the site, the aquatic basin can be made to appear more as a natural wetland area than a rectangular man-made depression.

Shown above is a wet pond (BMP) at Chesterfield Marketplace Shopping Center that becomes a water feature with an attractive tubular steel fence around it.

DRY BASINS: As with aquatic basins, dry basins tend to be trash collectors, especially if fenced. Whenever possible, we will look to you to design the dry basin using curvilinear land forms without steep slopes to make the basin depression appear as a natural land form that becomes more of a yard than any appearance of a hard, rectangular basin. When designed in a manner that allows for regular mowing, cleanup of debris and general maintenance is done on a more regular basis.

Dry basins often need to be located in setbacks that have their own landscaping requirement to be fulfilled. Environmental Enginneering does allow landscaping within the basins, using the list of plants that they accept. See pages 12-c.1 through 12-c.5.

If the site dictates that a basin must be designed in a hard, rectangular fashion with steep side slopes, then landscaping should be applied that limits the view of the basin from the public view.



Shown above is an example of using curvilinear land forms, mowable slopes, and landscaping to make a dry basin fit more into the natural landscape.

PLANT MATERIALS

Below is the list of plant materials that the Environmental Engineering Department will allow within a basin, provided no plant materials are planted close to the center flow line of water through the basin.

TABLE 3.1 RECOMMENDED PLANT SPECIES FOR USE IN BIORETENTION --- SHRUB SPECIES

Species		Moisture Regime		Tolerance						Morphology			General Characteristics		
Scientific Name Common Name	Indicator Status	Habitat	Ponding (days)	Salt	Oil/ Grease	Metals	Insects Disease	Exposure	Form	Height	Root System	Native	Non-native	Wildlife
Berberis koreana barberry	FAC	Mesic	2-4	H	H	H	M	Sun to partial sun	Oval shrub	4-6'	Shallow	-	Yes	Low
Berberis thunbergii Japanese barberry	FAC	Mesic	2-4	H	H	H	M	Sun	Rounded, broad dense shrub	5-7'	Shallow	-	Yes	Med.
Clethra alnifolia sweet pepperbush	FAC	Mesic to wet Mesic	2-4	H	-	-	H	Sun to partial sun	Ovoid shrub	6-12'	Shallow	Yes	-	Med.
Cornus Stolonifera red osier dogwood	FACW	Mesic - Hydric	2-4	H	H	H	M	Sun or shade	Arching, spreading shrub	8-10'	Shallow	Yes	-	High
Euonymus alatus winged euonymous	FAC	Mesic	1-2	H	H	H	M	Sun or shade	Flat, dense horizontal branching shrub	5-7'	Shallow	-	Yes	No
Euonymus europaeus spindle-tree	FAC	Mesic	1-2	M	M	M	M	Sun to partial sun	Upright dense oval shrub	10-12'	Shallow	-	Yes	No
Hamamelis virginiana witch-hazel	FAC	Mesic	2-4	M	M	M	M	Sun or shade	Vase-like compact shrub	4-8'	Shallow	Yes	-	Low
Hypericum densiflorum common St. John's wort	FAC	Mesic	2-4	H	M	M	H	Sun	Ovoid shrub	3-6'	Shallow	Yes	-	Med.
Ilex glabra Inkberry	FACW	Mesic to wet Mesic	2-4	H	H	-	H	Sun to partial sun	Upright dense shrub	6-12'	Shallow	Yes	-	High
Ilex verticillata winterberry	FACW	Mesic to wet Mesic	2-4	L	M	-	H	Sun to partial sun	Spreading shrub	6-12'	Shallow	Yes	-	High
Juniperus communis "compressa" common juniper	FAC	Dry Mesic - Mesic	1-2	M	H	H	M - H	Sun	Mounded shrub	3-6'	Deep taproot	-	-	High

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FACW Facultative Wetland - Usually occur in wetlands, but occasionally found in non-wetlands.

PLANT MATERIALS(continued)

TABLE 3.1 RECOMMENDED PLANT SPECIES FOR USE IN BIORETENTION --- SHRUB SPECIES

Species		Moisture Regime		Tolerance						Morphology				General Characteristics		
Scientific Name Common Name	Indicator Status	Habitat	Ponding (days)	Salt	Oil/ Grease	Metals	Insects Disease	Exposure	Form	Height	Root System	Native	Non-native	Wildlife
Juniperus horizontalis 'Bar Harbor' creeping juniper	FAC	Dry Mesic - Mesic	1-2	M	H	H	M - H	Sun	Matted shrub	0-3'	Deep taproot	-	Yes	High
Lindera benzoin spicebush	FACW	Mesic to wet Mesic	2-4	H	-	-	H	Sun	Upright shrub	8-12'	Deep	Yes	-	High
Myrica pennsylvanica bayberry	FAC	Mesic	2-4	H	M	M	H	Sun to partial sun	Rounded, compacted shrub	6-8'	Shallow	Yes	-	High
Physocarpus opulifolius ninebark	FAC	Dry Mesic to wet Mesic	2-4	M	-	-	H	Sun	Upright shrub	8-12'	Shallow	Yes	-	Med.
Viburnum cassinoides northern wild raisin	FACW	Mesic	2-4	H	H	H	H	Sun to partial sun	Rounded, compacted shrub	6-8'	Shallow	Yes	-	High
Viburnum dentatum arrow-wood	FAC	Mesic	2-4	H	H	H	H	Sun to partial sun	Upright, multi-stemmed shrub	8-10'	Shallow	Yes	-	High
Viburnum lentago nannyberry	FAC	Mesic	2-4	H	H	H	H	Sun to partial sun	Upright, multi-stemmed shrub	8-10'	Shallow	Yes	-	High

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PLANT MATERIALS(continued)

TABLE 3.1 RECOMMENDED PLANT SPECIES FOR USE IN BIORETENTION --- TREE SPECIES

Species		Moisture Regime		Tolerance					Morphology			General Characteristics		
Scientific Name Common Name	Indicator Status	Habitat	Ponding (days)	Salt	Oil/ Grease	Metals	Insects Disease	Exposure	Form	Height	Root System	Native	Non-native	Wildlife
Quercus shumardii Shumard's red oak	FAC	Mesic	2-4	H	H	H	M	Sun to partial sun	Large spreading tree	60-80'	Deep taproot	No	-	High
Robinia pseudo-acacia black locust	FAC	Mesic - Xeric	2-4	H	H	H	M	Sun	Typically tall and slender	30-50'	Shallow	Yes	-	Low
Sophora japonica Japanese pagoda tree	FAC	Mesic	1-2	M	M	-	M	Sun	Shade tree	40-70'	Shallow	-	Yes	Low
Taxodium distichum bald cypress	FACW	Mesic - Hydric	4-8	-	-	M	H	Sun to partial sun	Typically single stem tree	75-100'	Shallow	Yes	-	Low
Thuja occidentalis arborvitae	FACW	Mesic to wet Mesic	2-4	M	M	M	H	Sun to partial sun	Dense single stem tree	50-75'	Shallow	-	Yes	Low
Zelkova serrata Japanese zelkova	FACU	Mesic	1-2	M	M	-	H	Sun	Dense shade tree	60-70'	Shallow	-	Yes	Low

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PLANT MATERIALS(continued)

TABLE 3.1 RECOMMENDED PLANT SPECIES FOR USE IN BIORETENTION --- TREE SPECIES

Species		Moisture Regime		Tolerance					Morphology			General Characteristics		
Scientific Name Common Name	Indicator Status	Habitat	Ponding (days)	Salt	Oil/ Grease	Metals	Insects Disease	Exposure	Form	Height	Root System	Native	Non-native	Wildlife
Acer rubrum red maple	FAC	Mesic - Hydric	4-8	H	H	H	H	Partial Sun	Single to multi-stem tree	50-70'	Shallow	Yes	-	High
Amelanchier canadensis shadbush	FAC	Mesic	2-4	H	M	-	H	Partial Sun	Single to multi-stem tree	35-50'	Shallow	Yes	-	High
Betula nigra river birch	FACW	Mesic - Hydric	4-8	-	M	M	H	Partial Sun	Single to multi-stem tree	50-75'	Shallow	Yes	-	High
Betula populifolia gray birch	FAC	Xeric - Hydric	4-8	H	H	M	H	Partial Sun	Single to multi-stem tree	35-50'	Shallow to deep	-	Yes	High
Fraxinus americana white ash	FAC	Mesic	2-4	M	H	H	H	Sun	Large tree	50-80'	Deep	Yes	-	Low
Fraxinus pennsylvanica green ash	FACW	Mesic	4-8	M	H	H	H	Partial Sun	Large tree	40-65'	Shallow to deep	Yes	-	Low
Ginkgo biloba Maidenhair tree	FAC	Mesic	2-4	H	H	H	H	Sun	Large tree	50-80'	Shallow to deep	-	Yes	Low
Gleditsia triacanthos honeylocust	FAC	Mesic	2-4	H	M	-	M	Sun	Small canopied large tree	50-75'	Shallow to deep variable taproot	Yes	-	Low
Juniperus virginiana eastern red cedar	FACU	Mesic - Xeric	2-4	H	H	-	H	Sun	Dense single stem tree	50-75'	Taproot	Yes	-	Very High
Koelreuteria paniculata golden-rain tree	FACU	Mesic	2-4	H	H	H	H	Sun	Round, dense shade tree	20-30'	Shallow	-	Yes	No
Liquidambar styraciflua sweet gum	FAC	Mesic	4-8	H	H	H	M	Sun	Large tree	50-70'	Deep taproot	Yes	-	High
Nyssa sylvatica black gum	FACW	Mesic - Hydric	4-8	H	H	H	H	Sun	Large tree	40-70'	Shallow to deep taproot	Yes	-	High

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Species		Moisture Regime		Tolerance					Morphology			General Characteristics		
Scientific Name Common Name	Indicator Status	Habitat	Ponding (days)	Salt	Oil/ Grease	Metals	Insects/ Disease	Exposure	Form	Height	Root System	Native	Non-native	Wildlife
Platanus acerifolia London plane-tree	FACW	Mesic	2-4	H	-	-	M	Sun	Large tree	70-90'	Shallow	-	Yes	Low
Platanus occidentalis sycamore	FACW	Mesic - Hydric	4-8	M	M	M	M	Sun	Large tree	70-90'	Shallow	Yes	-	Med.
Populus deltoides eastern cottonwood	FAC	Xeric - Mesic	4-8	H	H	H	L	Sun	Large tree with spreading branches	75-100'	Shallow	Yes	-	High
Pyrus calleryana Calery pear	FAC	Mesic	2-4	H	H	H	H	Sun	Dense shade tree	30-50'	Shallow to deep	-	Yes	Low
Quercus bicolor swamp white oak	FACW	Mesic to wet Mesic	4-8	H	-	H	H	Sun to partial sun	Large tree	75-100'	Shallow	Yes	-	High
Quercus coccinea scarlet oak	FAC	Mesic	1-2	H	M	M	M	Sun	Large tree	50-75'	Shallow to deep	Yes	-	High
Quercus macrocarpa bur oak	FAC	Mesic to wet Mesic	2-4	H	H	H	M	Sun	Large spreading tree	75-100'	Taproot	-	Yes	High
Quercus palustris pin oak	FACW	Mesic - Hydric	4-8	H	H	H	M	Sun	Large tree	60-80'	Shallow to deep taproot	Yes	-	High
Quercus phellos willow oak	FACW*	Mesic to wet Mesic	4-8	H	-	-	H	Sun	Large tree	55-75'	Shallow	Yes	-	High
Quercus rubra red oak	FAC	Mesic	2-4	M	H	M	M	Sun to partial sun	Large spreading tree	60-80'	Deep taproot	Yes	-	High

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